

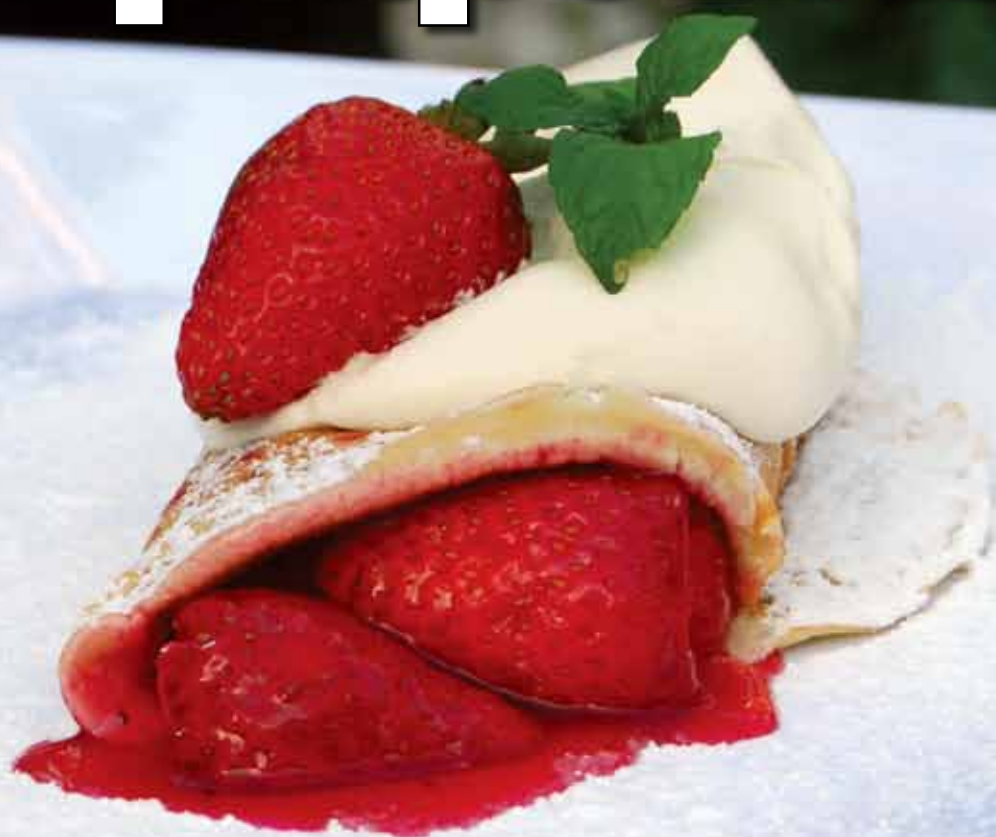


The No.1 Aquaponics magazine
for the backyard enthusiast.

Edition 11

Bringing Food Production Home

Backyard Aquaponics



Strawberries

The fruit of **Love**

An introduction to **IBCs**

The Big BYAP **Experiment**

Welcome

We've got a wide range of stories in this issue. There's an interesting article by Dr Bob Longmore about how he grows compost worms that he can feed to his fish by using scrap office paper, a handy article for the recyclers among you.

Rowena and Philip Mansfield bring us another informative article from their aquaponic herb farm in Wales, as they share with us their experiences and methods for growing strawberries. Then Faye gives us some ideas on what to do with strawberries, like the beautiful strawberry pancakes picture on the front cover. Richard Allan tells us all about his aquaponic adventures in Victoria, and Mark gives us another update with his "picking from the patch" regular column.

We have the results of the photo competition for 2010. Bullwinkles photos ended up being a fairly easy winner by the

end of the voting. His pictures of blue barrel landscapes are quite amazing and he shares with us how they came about. We've also got a few of the photos from the runners up, Embi and Wazza.



Many of you probably know about Faye's fascination with bugs of all shapes and sizes, in this edition she investigates shield bugs, these nasty bugs can cause quite a lot of devastation in a vegetable garden.

Another packed edition with more than I can cover here, thanks for reading. ●

Joel Malcolm, Editor

Backyard Aquaponics



Backyard Aquaponics Magazine

is a quarterly publication which aims to promote the ideas of Aquaponics and home food production coupled with healthy and sustainable living.

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Contributors

Dr Bob Longmore, Rowena & Philip Mansfield, Richard Allan, Mark England, Faye Arcaro, Joel Malcom, Jim Vagg

Magazine Enquiries

enquiries@byapmagazine.com

Editor: Joel Malcom

www.byapmagazine.com

Who are We?

Backyard Aquaponics Magazine is produced in-house at Backyard Aquaponics.

PO Box 3350

Success, WA 6964

Ph: (08) 9414 9334

The shop: Cnr Jandakot Road & Berrigan Drive, Jandakot, WA 6164

Editor: Joel Malcom

Sub Editor: Faye Arcaro

Design & Lay-out:

Sarah Upravan

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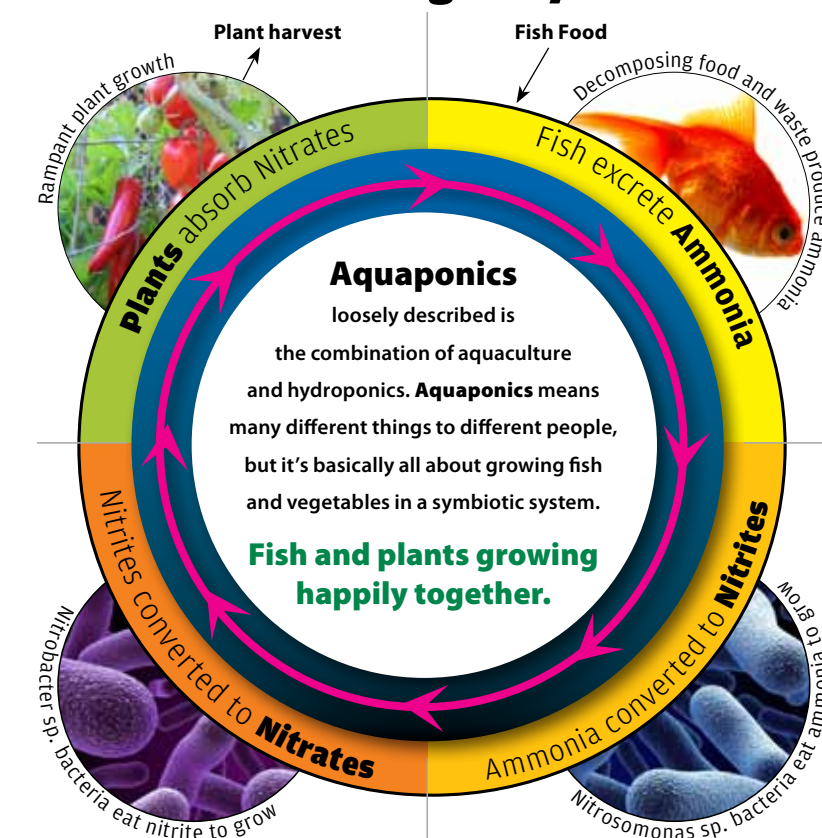


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The Nitrogen Cycle



Backyard Aquaponics on the tube

There are a whole range of aquaponics videos that you can view on youtube, visit the link below and see us in action! New videos are added regularly.
www.youtube.com/user/backyardaquaponics



Fish paper & worms

By Dr Bob Longmore

Most keen gardeners have, at one time or another, set up a worm farm to sustainably dispose of kitchen and garden waste and to provide worm castings and liquor as by-products. The overall process is well documented and trusted to work.

When we lived in Willetton I bought a Council-sponsored, recycled plastic compost bin which I used as a worm farm by standing it on a sloping piece of Colorbond sheet. A fitted gutter directed worm liquor into a bucket or container. I used the worm farm mainly as a disposal system for the kitchen waste not fed to our backyard hens.

Later on, and now retired to the little 'Garden Village' of Nannup in the SW of Western Australia, we are active members of the community, and in some of my dealings with committees and working parties, the question of waste paper disposal has been discussed. An average office equipped

with a paper shredder provides the ideal solution to rendering confidential papers harmless, whether it be in a home or commercial setting but what to do with the shredded product? A simple check on the Internet provides little encouragement unless one is in the habit of sending large quantities of fragile objects through the post! Shredded paper can be used as mulch but it's obvious brightness makes it unsightly as a scattered mulch in the average garden setting. It provides extremely useful bedding in chook sheds and even as bedding for larger animals, from whence it can be moved as nitrogen-enriched organic material into the compost heap, but the whiteness still remains! I understand it can provide the basis of 'papercrete', but that is outside my experience.

One of my principal pastimes, in addition to gardening, is fishing. Some of my catch, particularly herring, skipjack and the larger redfin perch,

is eaten and the waste remains are normally allowed to ferment in a large plastic drum to produce potent liquor which can be diluted to 'tea' strength and used as an organic fertiliser and foliar feed in the garden. I don't waste any useful feed stuff for the drum – I also breed maggots for my fishing trips, using the bodies of bronze-coloured feral goldfish caught at my local Barrabup Pool. The 'spent' carcasses go into the drum, as do 'spent' chicken necks from the same process.

My advance over this last year or so has been to pour sackfuls of shredded paper into my fermenting fish liquor mix, stirring and allowing the paper to soak up the rotting soup. After a few days I find the paper mass floating on the surface and already taking on a greyish colour. I then found that scoopfuls of the soggy paper mix added as separate heaps to my worm farm were eagerly consumed by the compost worms to the extent that turning over the surface would reveal

healthy masses of very clean worms burrowing into the paper. It has been my habit to also add quantities of torn or shredded corrugated cardboard to the 'farm', as well as kitchen food scraps – meat bits and bones go to the hens. So, what I have developed is a method of converting waste shredded paper into a potent nutritious feed for worms. The paper itself ends up as fine, greyish-white particles, now more easily dispersed into the garden.

One of my vegetable garden interests has been setting up some relatively crude fish-keeping systems using old water tanks fitted with new then cured concrete bottoms. I have acquired a good number of such water tanks from surrounding neighbourhood farms and properties, cut them up into manageable round sections and used them as general raised beds for vegetable growing. The better condition tanks provide the basis of my aquaculture efforts.

Presently I keep goldfish, both ornamental and 'orrible feral, in tanks, as well as redfin perch and white cloud mountain minnows. The latter breed

keeping some of the smaller redfin perch alive, while we do eat the larger fish after filleting and skinning them. I may add that I kill the normal run-of-the-mill, drab greenish-bronze feral

reasonably well in good health even during hot summer weather. One of the tanks, the one populated by some feral goldfish, is part of my embryonic aquaponics system, and that is equipped with a dirty-water pump on a timer and a reticulation system still in development.

I feed the redfin perch with worms most mornings, dropping the whole worms onto a large, floating upside-down plastic crate which is there to provide some shelter and refuge. At present I do this manually, sorting out the worms on a simple tray. This does allow a routine, daily inspection of the tank. The worms fall through the slots to waiting mouths or the crate shakes as the worms are grabbed as they emerge through the bottom.

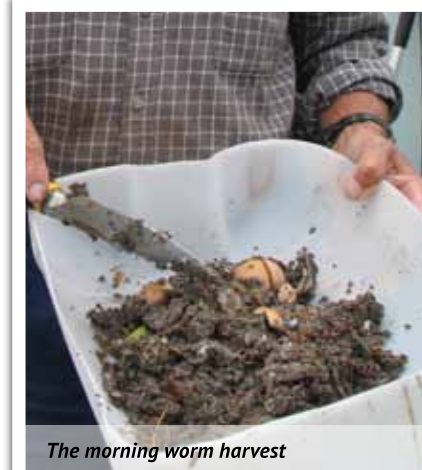
So there you have it, an efficient waste disposal system for shredded paper and fish offal, producing large numbers of good quality compost worms suitable for feeding captive fish and as prime bait for future fishing trips.

well, are not aggressive, unlike mosquito fish, *Gambusia*, but must be kept out of river systems. The local fresh water dams and pools round my home town of Nannup tend to be populated with feral goldfish and redfin perch and these are my principal freshwater fishing quarry. I use very light pole methods, but that's another story!

Quite naturally I had wondered about

goldfish catch using the carcasses to breed maggots for future fishing expeditions! The better gold coloured fish which occasionally sprinkle my catches are retained alive for my tanks.

Now, horror of horrors, I must admit that my normal fish tanks are not aerated artificially or equipped with pump systems, but are still water and deep enough to maintain the fish



The morning worm harvest



Selecting worms for feeding



Small red fin perch doing well!



Lively perch



Worm bin and paper feed



In the worm bin



Rotting fish and paper drum



Strawberries

The strawberry plant is a member of the Rosaceae family and the genus, *Fragaria*. Many people believe that the strawberry is a fruit, the fleshy red outgrowth is actually the receptacle of the strawberry flower. Thus, it is also called a 'false fruit'.

The sweet and tasty fruit, strawberry, has many qualities that make it a popular and also a nutritious fruit. Strawberries were cultivated by the Romans as early as 200 BC. In medieval

times strawberries were regarded as an aphrodisiac and soup made of strawberries, borage and soured cream was traditionally served to the newlyweds at their wedding breakfast.

The strawberry fruit is grown in many parts of the world. Basically, a crop grown in temperate countries, it is now adapted to various tropical climates. In India, strawberries are mostly grown in Nainital and Mahabaleshwar. It has also been successfully grown in the plain regions along the hilly areas.

By Rowena and Philip Mansfield

The strawberry is a rich source of vitamins and minerals. The fact that strawberries contain few calories makes it an excellent food for diabetics and patients in general.

They contain more vitamin C than oranges, are high in fibre and a good source of folic acid.

Strawberries have been found to reduce risk of cancer, enhance memory function and relieve rheumatoid arthritis.

Growing Conditions

The strawberry requires good drainage and ventilation plus a good quality water supply. In summer the plant will require plenty of water to produce full bodied fruit and whilst this makes a nutrient film technique system ideal for strawberries it means that a wary eye will have to be kept on roots clogging up the system. Likewise some adaptation may have to be made with a flood and drain system to ensure that the end of the flood cycle does not cause the plant to dry out. The ideal temperature for strawberry growth and fruiting is 15 to 20 degrees C. (We have had strawberries literally melt on the side of the channels when the temperature shot up into the upper 40's C.)

They require a high level of light for about 16 - 18 hours per day. Plenty of ventilation is advisable not just to limit the spread of disease but to assist in pollination. If growing under cover, consideration should be given to introducing beneficial pollinators such as bumble bees to do nature's job of winging pollen from one plant to another. We have a couple of low energy fans running all the time in the polytunnels where strawberries are grown.

Our most successful set-ups have been the "A" frames. The frames were

constructed from wood left over from the demolition of an old caravan (trailer home) which was made into a half A frame. Onto this were clipped runs of 110mm pipe with 35mm holes cut into them at 100mm intervals. Pieces of 35mm waste pipes were inserted into the holes and the plants housed into these bits of pipe with the roots protruding from the bottom. When the base of these pieces of pipe rest on the bottom of the 110mm pipe there is a natural gap for the roots to expand and take up the nutrient enriched water.

This small set up cost the princely sum of £24 including the pump, pipework and reservoir. Everything else was just bits and pieces found around the holding. This is a hydroponic build where control of the nutrients is rigidly monitored - but introducing growbeds and fish need not present an insurmountable problem and it is something we are designing for one of our elevated systems to be built in the next 12 months.

We have also produced a moderate amount of very good strawberries in our constant flow AP growbeds but the

“ Strawberries have been found to reduce risk of cancer, enhance memory function and relieve rheumatoid arthritis. ”

slugs and birds had their greedy eyes on the fruit and we had to share our crop with them.

We have also found that trying to re-grow strawberries in the following season, using the same plants is a failure and new plants need to be introduced each year. This does not mean the old plants are wasted as they will produce crops for two more seasons but need to be planted in the ground. When the strawberry growing season is over, often in September, we remove the strawberries and replant the frame with lettuce and brassicas which maximises the growing space.



Building the A Frame



Plants settling in



Picking the first berries



Various types

Strawberries typically grow very well in soilless environments, thus they are an ideal aquaponic and hydroponic crop with high potential yields. The strains we have grown in the UK are Gorella (early), Polka and Tago. These three have given us a fairly long growing season. Buying in “everbearers” such as Elsanta and Flamenco will also give a very long growing season but the one thing we always do to prevent the plants all fruiting at the same time is prick out the early flowers of those strains that need to fruit later in the season. All countries have strawberries that have been found to produce well in a particular climate so it is well worth looking up local growing information and abiding by what has proved successful.



High pH can cause iron deficiency

Nutrient Requirements

A pH of 6 is ideal as a high pH can cause iron deficiency. In an aquaponic system where a programme of chelated iron is being adopted the plant should flourish. Conductivity factor (CF) of 35 will ensure good development and fruiting and this is recommended by all hydroponic literature but achieving this level of total dissolved salts in aquaponics with specific chemical requirements such as sulphur, boron, magnesium etc., may be difficult to achieve. However, we have had very good results with strawberries in AP and we attribute this to the inclusion of worms in the growbeds. (No doubt someone, one day will actually produce an analysis of the efficacy of the worms in AP other than anecdotal comment.)

Strawberry Diseases and Pests

The major pests and diseases of strawberries are aphids, red spider mite, slugs, also bear in mind mice, voles and birds. Birds are attracted by the bright colour and will empty a run of ripe strawberries in next to no time. A regular regime of parasitic insects that prey upon aphids and other nasty creepy crawlies should control the problem.

In AP this biological control is really the only way to keep the bugs down. Diseases such as botrytis can decimate a crop and this disease is heightened as the temperature in the system elevates, so keeping a good flow of air will hinder the build up of damaging spores.

We fumigate at regular intervals with

sulphur fumes/smoke which not only helps with limiting fungal infections but also kills spidermite and other pests (do NOT use sulphur near your cucumbers) We are not sure if sulphur has any effect upon aquatics, as we have not needed to try it anywhere near the fish.

When to Harvest

The fruit needs to be harvested as it changes to red and this should be done on a daily basis and always pick with the stalk still attached. If picking for sale other than the day of harvest then it is advisable to pick when the fruit is pink and then place it in a cool place, 10 to 15 degrees C. If it is going to be some days before offered for consumption then the temperature can be dropped to say, 5 degrees C. However, the best time is when they are picked red, plump

and sweet, plus a generous dollop of fresh cream and perhaps a sprinkle of sugar. Yummie!

How to make new strawberry plants

Strawberries are propagated by runners. During August and September, strawberry plants will throw out runners which bear mini strawberry plants. Runners should be pegged down into the surrounding growing area or into 3 inch pots. The new strawberry plants will soon have its own root system and can then be severed from the parent plant.

Storing strawberries for later use

Strawberries can be frozen for out of season use, although they will not keep

their shape. On defrosting they tend to go rather soggy and wet, ideal for making strawberry milkshakes etc, but not for decoration. The most common use is to make strawberry jam.

If you end up with a glut when the season draws to a close, add them to homemade ice cream or sorbet, or make homemade vinegar and liqueur. If you make strawberry jam, remember that the berries are low in pectin, so add some lemon juice or bottled pectin to help the jam set.

There are many recipes for strawberries and everyone has their favourite or tried and tested way of using these delicious fruits.

You can even drink the strawberries in shakes, juices and smoothies or add as decoration to alcoholic drinks.



Washed and ready to devour



Harvesting the beautiful fruit



Excess fruit is never a problem



Strawberry Semifreddo**Serves 6****500g fresh strawberries hulled****100g icing sugar sifted****juice of 1/2 lemon****1 1/4 cups thickened cream**

Blend strawberries, icing sugar and lemon juice in a food processor until smooth. Remove the seeds by pressing mixture through a sieve. Whip cream until its consistency is thick but able to drop off a spoon. Fold strawberry mixture through the cream.

Pour into a shallow container and freeze. When frozen just at the edges, remove take out and beat with and electric beater. Return to the freezer. Repeat process 2-3 times.

Before serving leave icecream in fridge for at least 20 minutes.

This recipe can also be used with an icecream maker.

*Strawberry Semifreddo**Ultimate Milkshake***Ultimate Strawberry Milkshake****Serves 2****125g fresh strawberries, hulled and roughly chopped****1 1/2 cups milk****4 scoops strawberry ice-cream**

Blend strawberries until finely chopped. Add milk and ice cream and blend until smooth. Add icecream until well combined and thick. Pour into two highball tumblers and serve immediately.

Strawberry Crepes**Serves 4****500g strawberries hulled and halved****1/4 cup caster sugar****1 tsp vanilla essence****4 freshly made or frozen crepes****icing sugar to dust****custard warmed to serve**

Pre-heat oven to 180C. On a lined non-

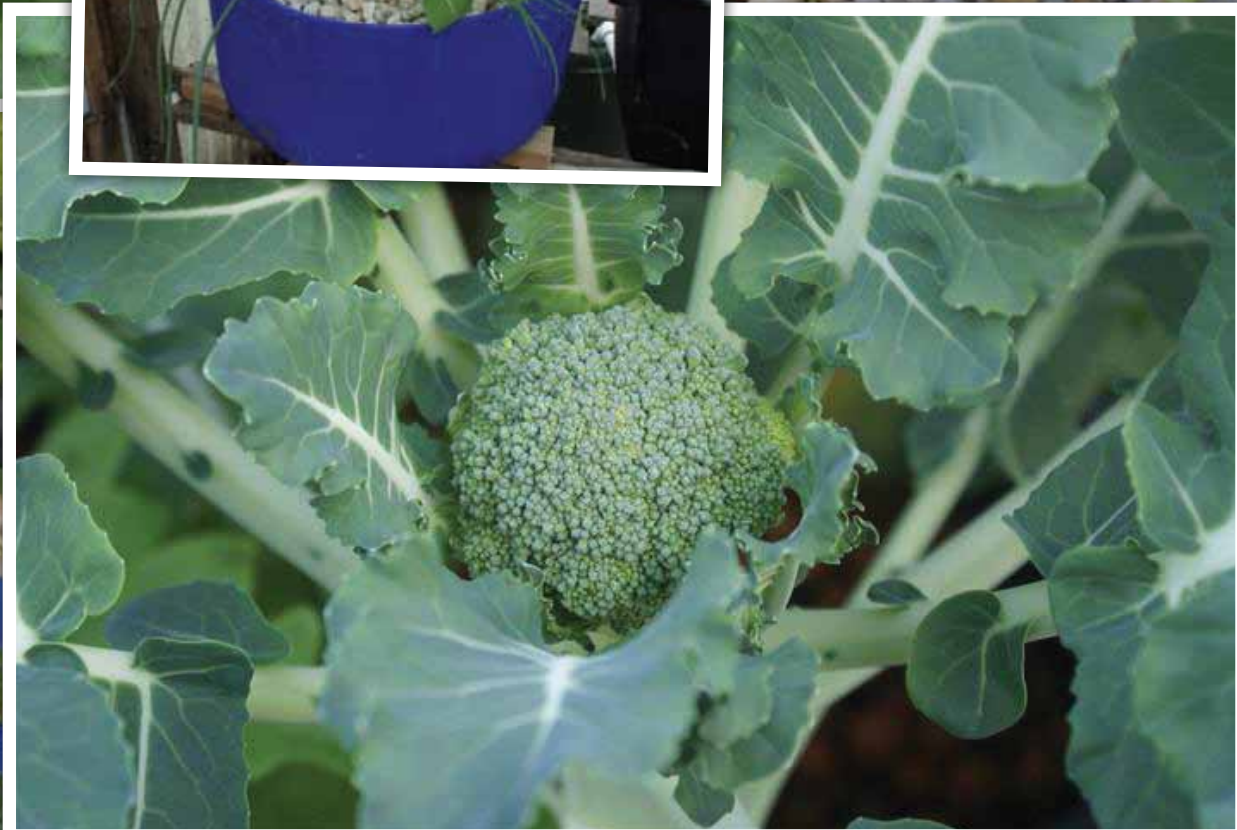
stick baking tray, place strawberries in a single layer and drizzle with vanilla essence and sprinkle with caster sugar, roast until strawberries soften slightly and a syrup develops.

Warm crepes and divide strawberries and syrup evenly among each crepe and dust with icing sugar. Serve immediately with warmed custard on the side.

*Strawberry Crepes*

blue barrels and beyond

By Richard Allan



“

Richard from Horsham Victoria has been a keen vegetable gardener for a few years now and recent water restrictions have spurred him into installing 13500 litres of rain water tanks to use on the vegetable garden. For current updates Richard has an online diary at aridpatch.blogspot.com which covers the A, B, C's of food production A is for aquaponics, B is for beer, C is for cheesemaking and the list goes on.

”

1

I first became aware of Aquaponics from a thread on a homebrewing forum and a fellow brewer who had an IBC setup growing Murray cod. Some googling soon found the BYAP website and forum as well as a few others and the obsession began. Much research and many questions on the forums later, I now have two systems up and running.

My first system is in one side of my greenhouse and has a 500L aquaculture fish tank and growbeds made from blue barrels and black tubs purchased from the local hardware shop. The four growbeds have autosiphons in them and drain directly into the fish tank, and the pump in the fish tank supplies the growbeds.

This system started cycling in April 2010 with several goldfish, and then 6 weeks later I got 20 Rainbow Trout to replace the goldfish. The rainbow trout have been harvested from the start of October and the last were taken out late November, as the weather was getting too warm for them.

It now has 15 little Jade Perch and I will put another 10 silver perch in there shortly. It will be interesting to see if I can get the Jade Perch to edible size. If not to edible size by the time winter comes, will I be able to get them through winter here in Victoria?

I started building my second larger system outside of the greenhouse in mid July after receiving a 2000L round fish tank and two BYAP growbeds. I

later got a 1000L oval shaped trough to use as the sump.

I decided to build it as a chift pist or chop system and ordered a 6000L pump.

I worked out some levels and decided the fishtank would need to be raised a bit. So I made an earth pad and levelled the tank. Next I put in the sump and mounted the first bed over it. Also installed the outlet pipe from the fish tank sump for the overflow outlet.

Installed the second growbed and installed the pump and overflow pipework.

I started cycling the system at this point and planted out the beds. A few weeks later I made a shade hoophouse to go over the entire system as our summers here are fierce. Also found a couple of 220L black tubs at the hardware store and installed them as extra growbeds.

All growbeds have an Affnan autosiphon and flood in roughly 12mins and drain in about 1 minute for the small beds and 5mins for the BYAP beds.

This system has a few fat goldfish and 25 silver perch and I will add another 40 silver perch soon. I also intend to get a few catfish and bass early in 2011.

To say that Aquaponics is an obsession is an understatement. So far we have harvested loads of vegetables and 14 rainbow trout.



Rainbow trout Harvest



My greenhouse





Picking from the patch

By Mark England

1t's that time of year again, time for the fish harvest. Our fish have been steadily growing over the last 6-8 months and they are ready to eat. It's the part of AP that some people may find a little difficult to come to terms with. You've been saying hello to and feeding your fish, in our case rainbow trout, almost daily for the last six months and now it's time to dispatch them. If you have young children as we do, it could also be a difficult to approach subject.

From day one we have taught our two young girls that we will be eating the fish at some stage. For me it is a big thing to know where at least some of my food has come from, what it has eaten, how it has lived and been treated.

We invited some friends around to the patch and set forth with some baited fishing rods held eagerly by young hands excited at the prospect of catching their first ever fish. It didn't take long as one hundred and fifty hungry rainbow trout lunged at the offered morsels.

Once we had filled a couple of buckets full of fresh trout we cleaned them and then set about dividing them amongst

the families. It's a great thing being able to share something that you have taken the time to nurture and grow, knowing that it will also nurture others.

I wanted to have a go at smoking some trout and having bought a large smoker we placed about a dozen trout in the smoker and set them to spend the next couple of hours amidst some smouldering hickory chips. As for the rest of the trout we cryovaced in packs of three and placed them in the freezer for future use. The amount we harvested should keep us in fish for the rest of the year until the next fish harvest of silver perch.

On the other hand our current veggie crop is just slowly ticking along. It's been a weird season. We've hardly had any sun and the rainfall has been unbelievable. We've had very humid weather, which has sent our lettuce to seed, the strawberries have stopped and we are yet to see a pumpkin or rockmelon.

We have had a strong crop of beans and the zucchinis are growing for the first time ever. We need to pick them fairly small though otherwise they

“We have had a strong crop of beans and the zucchinis are growing for the first time ever.”

shrivel and die. The one plant that seems to be doing really well is tomatoes and for the second year in a row I think we will have another bumper crop. We should be harvesting them just in time as we are down to our last bottle of tomato sauce from last season.

So with any luck we'll end up with a late summer and we'll get some amazing veggies. It's just another of the challenges along the way learning how to grow and “pick from the patch”.

“See what Mark has been doing at harvest365.blogspot.com”

PHOTO COMPETITION WINNER PHOTO COMPETITION WINNER PHOTO COMPETITION WINNER

Congratulations to the 2010 Backyard Aquaponics Forum Photo Competition Winner!



WINNER BULLWINKLE

The bit that I see as the sky is the back inside wall of the blue barrel.

What I see as the ocean (the blue water) is the reflected inside wall of the blue barrel.

I have no idea what all the starry sky stuff is on the long thin photo, or the stuff that looks like soda water bubble splashes in the mid-ground ocean in some photos. I suspect that the splashes were a reflection of the flash off the rear wall, and the starry stuff in some of the "skies" is simply nothing more than a normal, every day, generic mystery. (actually I

think this stuff is the best bit because my only contribution was to notice it after I took the photo, then go back and re-take it a few times using my finger to adjust the amount of flash it got so it wasn't washed out)

I love it when that happens.

The white reflected water is a reflection of the real sky, over exposed. (spot metering of fish to ensure the fish was exposed correctly)

And what I see as land (in the foreground), is just the algae showing through because it's in

the shade of the top blue barrel.

The "headland" in the background is just some algae on the back wall.

I have no idea why the headland looks like its roughly an infinite distance in front of the mystic, starry, deep background in some of the photos.

These photo's represent a few of probably fifty that didn't work for various reasons. Many of them being fish refusing to behave. The most difficult aspect was waiting for the tide to be correct to give the desired effect, the cooperation of the fishies and the sun.

RUNNER UP ENTRIES

Thankyou to all participants. Here are the entries that came close.



Submitted by Wazza



Submitted by Embi



Submitted by Wazza



Submitted by Embi



Submitted by Wazza



Submitted by Embi

Shield bugs

a garden pest

By Faye Arcaro

“

Although a shield bug has unusual armour, its also quite pretty in its colourings. However, they do tend to multiply in large numbers and if not kept at bay they damage crops and plants and become significant pests in the garden.

”

Shield bugs are distributed all over the world but originally found in East Asia. Shield bugs were not even reported in the west until the late 1990s. If you do not know what a shield bug is, then you might recognise the name “stink bug,” as they are the same insect.

A large triangular shield on their back usually makes for easy recognition. They are also very easy to distinguish by the foul smelling odour that they release. This odour is partly to ward off predators and also to use as a marker. They are excellent fliers and have a symbiotic relationship with bacteria that aid them in the production of nutrients.

They will also feed on other smaller insects if the opportunity presents itself; otherwise, they usually feed on vegetation of all kinds. If they do feed on fruits such as tomatoes for instance, the result is usually catastrophic for farmers. Apples will have a characteristic distortion, referred to by many as “cat facing.” The fruit becomes unmarketable. Shield bugs can also cause huge damage in cotton fields as well.

However, some scientists are investigating the economical impact of using predatory varieties of shield bugs. The reasoning behind this is that predatory shield bugs prevent caterpillars and other insect pests from

destroying plants, crops, trees, and suburban gardens. They could be used as a natural control agent in future.

About the odour

The insect has glands in its thorax between the first and second pair of legs. This gland produces the foul smelling liquid. The liquid is usually released as a fine mist and is made from aldehyde (type of organic acid).

If the insect sprays its chemicals into your eyes, they will immediately burn. The chemical is so potent that it can even cause abrasions to the cornea. Immediately flush the eyes with water and seek medical attention.

Biology

Its scientific name is Pentatomoidea, which is a superfamily of insects in the Heteroptera suborder of the Hemiptera order. These include water boatman, backswimmers, plant bugs, bed bugs, water striders, water scorpions, assassin bugs, flat bugs, red bugs, seed bugs and of course, stink bugs. They all share a common arrangement of sucking mouthparts.

A fully-grown adult will reach about 19 millimetres in length. Their shape is always triangular; their colours vary from brown to grey, dark green and blue. They have six legs, four wings, and two antennae. The nymphs are born without wings and have to go through stages to develop them.

Their piercing mouthparts are used mainly to suck sap from plants.

Variety of Shield bug commonly known as forest bug

Shield bug nymphs moult several times before becoming an adult (5th instar of the green shield bug)



A garden might only have one species of shield bug or it could have a few different varieties out of the many:

Green Shield Bug

Palomena prasine
This is the best known of all shield bugs and is often called the green stink bug or vegetable bug. They are encountered in gardens mainly in spring and autumn. The larvae and the adults are capable of hibernating in the winter. Most will turn brown before they take their long sleep. They will turn completely green again after hibernation.

Blue Bug

Zicrona caerulea
This insect has a greenish blue metallic

colour and can vary depending on the reflection of the light. They are capable of flying but hardly do so. They are the smallest shield bug and are often not even noticed because of their reclusive conduct. You will notice the blue bug larvae in late spring. They too will suck on insect larvae as well as plants, but will favour the leaf beetle larvae, which is found on Primroses. It loves to live in heaths, edges of forests, moors and not really in backyard gardens.

Striped Shield Bug

Graphosoma lineatum
This insect is easily identifiable by its black and red lines as well as spots on its underside. It is closely related to the green stink bug, but the smell is not

foul, but rather apple-like. Birds will not touch them because they find the taste appalling.

Sloe Bug

Dolycoris baccarum
Their basic colour is a kind of dark burgundy red with a fine, black punctuation. Of all the shield bugs, this is the worst. It loves all kinds of berries. As it walks over them, it leaves an awful stinking substance, which means the berries become inedible. They are found in fields, gardens, forests, and parks, sometimes in great numbers. It is also sometimes called the Hairy Bug, which actually is a more suitable name.



Shield bugs mating

“Interesting Facts,”

“Mexicans enjoy the aromatic flavour which comes from these pungent delicacies and may be eaten either raw or cooked in pate and salsa.”

“Parasitic wasps are attracted to the bug eggs by the same odour which repels other predators such as birds.”

“Some varieties of shield bugs have adapted to feasting on the juices of slow moving prey such as caterpillars as well as plant juices.”

Diet

They feed on the sap of leaves, flowers and fruit. Some have adapted to feed on the juices of insects such as caterpillars.

Habitat

Shield bugs shelter under foliage where they can remain undetected and camouflage themselves against the green stems of the plants. They move in where they feel safe and where a garden is not usually tended to each day. Places like aquaponic systems, orchards, farms, and backyard gardens can be prime locations.

Reproduction

They mate during the warm months (late spring until Autumn). The female will lay her eggs in large masses on the underside of leaves and stems. The eggs come in a variety of different colours including light pink, black or yellow and will change to white when they are ready to hatch, which is usually less than a week from being laid if weather conditions are favourable.

Otherwise, it might take several weeks.

The wingless nymphs then start their life cycle by going through four stages of moulting before they become winged adults. They will feed ferociously on plant sap and can almost destroy an entire crop if they are in huge numbers. They have a lifespan of up to nine months in favourable conditions.

Prevention and control

If you detect a few shield bugs on your plants, mix up some soapy water in a bucket. Place it underneath the bush or tree and start shaking it vigorously. Of course you can always pick them off and offer them to the eagerly awaiting fish or chickens, this is best done early morning while they are still lethargic. Biological control methods include parasitic wasps that will lay their eggs inside shield bug eggs. Predators of adult shield bugs include spiders and lizards.



Just hatched

Green shield bug laying eggs

the BIG BYAP experiment

By Joel Malcom

As aquaponics is still fairly much in its infancy so far as developments and trialling of different system styles go, we felt that it's up to people like us to put back into the industry with documenting trials of different system types.

The most effective way for us to do this is by putting some of our off the shelf hardware to good use in different

ways. The trials we are running are for a twofold purpose, most people don't have the opportunity to run different styles of systems side by side to make comparisons. Proponents of different styles of system sing the praises of their particular favourite and many debates have gone backwards and forwards over the various forum discussion boards. But the discussions are generally one sided, so we wanted to find out for ourselves

by running three separate systems side by side to compare water quality, growth rates and production levels.

Of course this is no scientific experiment as such; we don't have the ability, space or funds to set up more than three individual systems. This trial is perhaps better described as a series of observations, measurements and comparisons of different systems for interest's sake.

So onto the trial, what is it that we are experimenting with here? The three separate systems have been set up with different pumping methods:

All three systems consist of a 1000L fish tank, stocked with 25 Silver Perch fingerlings, a growbed 2.2m x 1.2m with 500Litres of expanded clay media, and an AC/DC air pump running continuously in the fish tank. A standard "off the shelf" Backyard Aquaponics Courtyard system in almost all respects except for the following:

System 1 Auto siphon

This system has an auto-siphon installed in the growbed. The pump runs continuously while the bell siphon floods and drains the bed in regular cycles.

System 2 Constantly flooded

This system incorporates a standpipe to set the flood level within the growbed. The pump runs continuously, so the water is constantly being pumped through the bed with the water level in the growbed and fish tank remaining constant.

System 3 Standpipe and Timer

This system runs on a 15 minute on, 45 minute off pumping cycle. A standpipe sets the flood level in the growbed and every hour the bed is flooded before being left to drain for 45 minutes. To date this has been the standard flood and drain method in our Backyard Aquaponics kit systems.

System 1

Auto siphon



System 2

Constantly flooded



System 3

Standpipe and timer



We will follow these systems over at least the next 12 months in the up and coming issues of the magazine. You'll be able to follow the growth rates, the harvests, and water quality tests along the way. See which style of system performs the best over an extended period of time, or will they all be fairly similar.

IBCs

an introduction

By Joel Malcom

The humble IBC, disposable industrial packaging that's become the cornerstone of many aquaponic system designs, they are a multipurpose, recycled, cheap, modular way to build an aquaponic system. An aquaponic system can easily be built in an afternoon with an IBC, a pump, a handful of fittings and a couple of regular power tools. IBC's along with blue 200L plastic barrels have enabled thousands of aquaponic systems to be built where normally people may not have the resources or the means to build a system any other way. IBC aquaponic systems have even proven themselves to be a marketable product, with many different complete aquaponic systems available for sale through classifieds. No matter how you look at it, they have a crucial role to play within aquaponics, the aquaponics community and the growth of aquaponics worldwide. What makes them so special? The ability to use them in such a variety of ways, and their self supporting outer stand. One IBC can be cut and turned into one aquaponic system, or alternately, multiple IBC's can be plumbed together and incorporated into rather large systems..

What is an IBC or tote.

IBC or Intermediate Bulk Container, also often termed as an IBC tote or a bulky, is a large industrial container used to carry, store and transport liquid products. They range in sizes from 500 litres – 1200 litres, though other sizes can also be found they are not as common. Without a doubt the most commonly available IBC is 1000 litres. These 1000L IBC's are generally around 1.2m, x 1.2m x 1.2 m tall, this cubic shape makes it ideal for efficient transporting of bulk liquids.

The basic construction of an IBC consists of a steel, plastic or wooden base that includes 4 way forklift lifting points for ease of moving around. This base provides a sturdy foundation to support an outside cage made from steel. The outer steel cage is generally constructed from either a reasonably thin gauge almost steel mesh cage, through to a welded tubular steel grid, welded tubular grids are probably the most commonly found IBC construction types. These cages are welded as one solid piece, then screwed onto the base at a number of points. The thin plastic liner is then slid down into the cage, then two tubular bars are bolted across the top to hold down the inner plastic container.

Because of the strength offered by the outer welded frame and solid base the inner plastic vessel that actually holds the liquids is only quite thin. Screw attachments on the base of the plastic liner and butterfly valves are common attachments and can come in a range of size, D50, D80, D150 depending on manufacturer. The top contains a large screw cap. generally between 6 inches and 12 inches across, these lids contain an inner 2 inch NPT threaded bung.

IBC's not only vary in size but they also vary in colour, most of the inner plastic containers are white, however you can find blue or black ones.

IBC's are reasonably cheap to buy, even new here in Australia you can buy



IBC distributed by SCHÜTZ DSL Group Pty Ltd

brand new containers for about \$350 - \$400, quite reasonable considering that many containers that might be used in aquaponics systems of a similar size usually cost a lot more. Then of course they are readily available second hand through drum recyclers, salvage shops, through classifieds, by knowing the right people, or if you're lucky it can be as simple as driving past an industrial area where companies might put them out with "for sale" signs on them.

Second hand IBC's generally come in a couple of different ways, "single use" are often a little more expensive, \$100-\$150 each. These containers have been used once to transport a liquid from one place to another, and then discarded. Usually these are in very good physical condition because they've had such little use. Then there's "used" IBC's, these may have been used many times over by numerous companies over time. It's almost impossible to know the complete history of these containers and what liquids they may have stored over that time. Used IBC's may often have physical

damage especially to the bases, they can sometimes have corrosion and missing taps or lids. They are usually reasonably cheap costing between \$50 and \$120 depending on their quality. Lastly refurbished IBC's are often available through drum recyclers. These IBC's are cleaned and pressure tested and often have had maintenance or repairs made as required.

One of the best ways to find used IBC's it to keep your eyes open around industrial areas or in your local paper, often businesses consider them to be a waste product, just packaging to be discarded after they are finished with their contents. Ask friends, you might be surprised at the various industries that use IBC's as part of their day to day operations.

Another advantage of the IBC is their stacking ability and the fact that they are very modular and their square form saves space when space is at a premium. On the downside square tanks are not the optimum shape for higher stocking levels of fish.



Advantages

Cheap
Readily available worldwide
Extensive design possibilities
Stackable
Modular

Disadvantages

Square
Most are not UV stabilized
Not designed for a long life
Very industrial looking
Thin plastic

Using an IBC

It's highly preferable to know the history of your IBC when buying for your aquaponic system, this is for a two fold reason. Firstly, fish are sensitive creatures and there are many liquid products that can leave residues, that might be harmful to your fish. Secondly, there may be residues that could be harmful to yourself or your family, so it pays to know what's been in your IBC, or in knowing that it's been professionally cleaned.

Often IBC's will contain information on the name plate on the side of the cage, from this information you can use the internet to find out about the substance that's been stored in the IBC. Generally if you type in the name of the product and "MSDS" you should get a "Material Safety Data Sheet" on the product, this will let you know if it is dangerous. This should also help you understand the best way to approach cleaning the IBC.

Washing an IBC

Often if you've bought your IBC in used condition then you will need to give it a good wash. A handy point to remember if you are going to cut your IBC, is to cut it first so that you can clean it more easily. Because there's such a small opening in the top cleaning can be quite difficult while it's still whole. Best if you can at least remove the inner plastic container from the frame, this is an easy thing to do as most IBC's have only two bars across the top, these are easily removed, then the inner plastic can be slid out.

Washing your IBC can often be a two step process depending on how dirty it is. I highly recommend initial rinsing to remove any larger amounts of material before washing out with a dilute mix of bleach and water. Then a further rinsing before leaving the IBC in the sun for a couple of days. UV helps to break down residues and remove any lingering odours that may remain.

Plumbing an IBC

Ultimately it's great to be able to use the existing external fitting that all IBC's generally have on the base. This is not always feasible depending on your design and on what the purpose is that you have for the IBC or part there of. When plumbing through the side of the IBC plastic wall, it is advisable to use a tank fitting. Tank fittings ensure that there is a large surface area clamping onto the plastic, so this is by far the safest means of plumbing through. There are other ways people use to plumb through a system that work quite well. These methods work sufficiently well for many people, but personally I prefer the added safety of a larger flange, just in case. The few extra dollars is worth the peace of mind.

Cutting an IBC

Without a doubt the simplest means of cutting an IBC is by using power tools. Possibly the best way of cutting the outer metal cage is with an angle grinder, if you don't have a grinder a sabre saw with metal cutting blade will also do a great job. Be sure to use all personal protective equipment when using power tools. The inner plastic liner can be cut with almost anything including a manual handsaw. I've found hand held circular saws and jigsaws to be most useful for this job. Be sure to mark where you want to cut before hand with a marking pen.

In the next edition of the magazine we will show you how to build a simple aquaponic system from an IBC. This step by step guide will show you how to build your own simple aquaponic system in no time at all. We will also be releasing a fantastic free guide to building an IBC system through the website very soon, This will be packed with photos and descriptions of dozens of different aquaponic systems that use IBC's.



Screw Cap in top of IBC



Philips screw holding outer frame to base



Tap fitting at the base of the IBC





Jim says "Aquaponics is the most enjoyable hobby anyone could ever have"

Jim's AUTOPOT aquaponics

By Jim Vagg

Jim started doing hydroponics in 2000, using components thrown away from the local people who didn't have any success and gave up because they were sick of failures or just too lazy, according to him. He had great results until 2006 when he was laid up in hospital. But then he saw Joels backyard aquaponic system on Gardening Australia. (Is this starting to sound familiar.) "That did it" says Jim "I promptly contacted Joel and purchased the Backyard Aquaponics book package and DVD."

Jim was off to a good start with the hot house and NFT (nutrient film technique) channels that he already had. He was able to purchase three 1000 litre fish tanks from a local fish breeder and made up the first growbeds from 60 litre stacking crates, plumbing them all together to make it a "flood and drain" style system. He then connected half the NFT channels into the system as a trial, but admits it was not greatly successful.

He now uses auto pots running on fish water and adds a small amount of nutrient to them and he reckons that they work very well. Jim says that as for his choice of media, scoria is by far the best and cheapest although it is very heavy and hard on your hands, not to mention it's also very dirty. Perlite mixed with scoria is good for root crops, expanded clay is light weight, clean, and good on the hands, but it is expensive and doesn't have the plant support of scoria. Jim says "I now have two 1000 litre growbeds filled with expanded clay and have to stake the tall plants." Probably no



Zucchini plants producing well in the autopots

surprise when you see just how tall his plants actually get.

Jim has caught hundreds of Redfin Perch over the years from the local creek weighing up to 1 kilogram. He stocked about thirty in his 1000 litre fish tank with fish averaging around 16 cm and grew them to 20cm in 15 months. After losing half of them he decided to eat the rest and finds them to be a very good eating fish but very difficult to feed as they don't like pellets. They did however get fed 200 gram tins of canned peeled



Brussel sprouts



Tomato bobbins are used to train the vertical growth

prawns every second day, which they absolutely loved. Jim bought the prawns on special for \$2.34 at the local supermarket. The redfin flesh is very white and the texture is firm and flakey with very good flavor which he enjoys panfried whole.

Fifty 14cm silver perch were purchased but unfortunately didn't survive the trip home. The fish farmers then delivered fifty replacement fish at no charge, but nearly all of them died from some complaint or other, the three remaining are the healthiest fish according to Jim and the best he's ever seen, though they haven't grown much in two years. Apparently other customers had similar experiences with the fish supplied from the same

growers and suspect there may have been a problem with them.

I grew fifty yabbies said Jim and would do them again, what we didn't eat they ate themselves and after having them for twelve months they even bred lots of babies, but the end result was that they killed one another. Next time I would separate them into different tanks.

The rainbow trout are excellent, very fast growing, great fish to feed and great table fish.

As for the carrots and parsnips, they grew very well in the perlite/ scoria mix but I think it could be a bit too wet as a lot of them split and they don't seem to

have that problem in the autopots.

As far as the difference between the hydroponics and aquaponics, in my opinion aquaponics is far more rewarding and satisfying. Aquaponics is the most enjoyable hobby that anybody could have. You grow the fish that you can look at, you don't have to monitor and adjust nutrients all the time. Just keep an eye on the ammonia, nitrites and pH, but that is no problem. The only real problem that I have found is the bugs. I don't use any kind of sprays, just sticky traps and the vacuum cleaner. I find that the aquaponic produce looks and tastes so much better than what is grown hydroponically.



Jim uses fish water and adds a small amount of nutrient to the autopots which work very well



Bumper harvest of broad beans

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Fruit & Vegetable **Planting Guide**

For Northern Hemisphere (NH) & Southern Hemisphere (SH)

Spring

NH: March, April, May

SH: September, October, November

Artichoke

Beans

Cantaloupe

Carrots

Collards

Corn

Cucumber

Eggplant

Garlic

Herbs

Kale

Kohlrabi

Leeks

Lettuce

Melons

Mustard Greens

Okra

Onions

Parsley

Parsnips

Peanuts

Potatoes

Pumpkins

Radish

Spinach

Squash

Strawberries

Swiss Chard

Turnips

Tomatoes

Watermelon

Zucchini

Summer

NH: June, July, August

SH: December, January, February

Beans

Chard

Corn

Garlic

Herbs

Lettuce

Mustard Greens

Onions

Okra

Peppers/Capsicum

Spinach

Radish

Squash

Tomatoes

Autumn/Fall

NH: September, October, November

SH: March, April, May

Beetroot

Bok Choy

Broccoli

Brussels Sprouts

Cabbage

Carrots

Cauliflower

Celery

Endive

Garlic

Kale

Kohlrabi

Lettuce

Mustard

Onions

Parsley

Peas

Radish

Spinach

Sugar Peas

Swiss Chard

Turnips

Winter

NH: December, January, February

SH: June, July, August

Asparagus

Beetroot

Broccoli

Brussels Sprouts

Cabbage

Cauliflower

Endive

Horseradish

Kale

Kohlrabi

Lettuce

Onions

Parsley

Parsnips

Peas

Radish

Rhubarb

Shallots

Spinach

Swiss Chard

Turnips

Conversion Table

Metric length		imperial
1 millimetre [mm]		0.03937 in
1 centimetre [cm]	10 mm	0.3937 in
1 metre [m]	100 cm	1.0936 yd
1 kilometre [km]	1000 m	0.6214 mile

Imperial length		metric
1 inch [in]		2.54 cm
1 foot [ft]	12 in	0.3048 m
1 yard [yd]	3 ft	0.9144 m

Metric volume		imperial
1 cu cm [cm3]		0.0610 in3
1 cu decimetre [dm3]	1,000 cm3	0.0353 ft3
1 cu metre [m3]	1,000 dm3	1.3080 yd3
1 litre [l]	1 dm3	1.76 pt
1 hectolitre [hl]	100 l	21.997 gal

Imperial volume		metric
1 cu inch [in3]		16.387 cm3
1 cu foot [ft3]	1,728 in3	0.0283 m3
1 fluid ounce [fl oz]		28.413 ml
1 pint [pt]	20 fl oz	0.5683 l
1 gallon [gal]	8 pt	4.5461 l

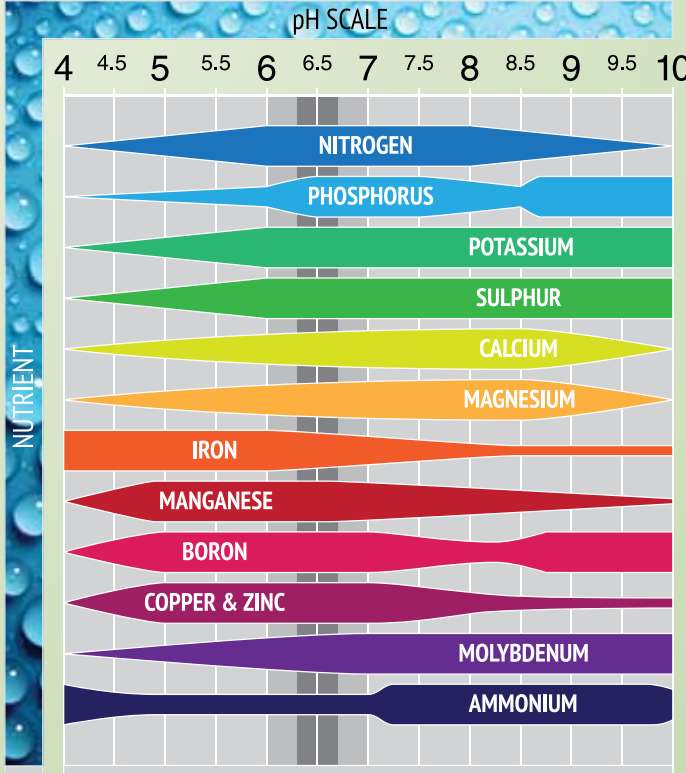
USA volume		metric
fluid ounce	1.0408 UK fl oz	29.574 ml
1 pint (16 fl oz)	0.8327 UK pt	0.4731 l
1 gallon	0.8327 UK gal	3.7854 l

Metric Mass		imperial
1 milligram [mg]		0.0154 grain
1 gram [g]	1,000 mg	0.0353 oz
1 kilogram [kg]	1,000 g	2.2046 lb
1 tonne [t]	1,000 kg	0.9842 ton

Imperial Mass		metric
ounce [oz]	437.5 grain	28.35 g
1 pound [lb]	16 oz	0.4536 kg
1 stone	14 lb	6.3503 kg
1 hundredweight [cwt]	112 lb	50.802 kg
1 long ton (UK)	20 cwt	1.016 t

Temperature Celcius		Fahrenheit
0 °C		32 °F
5 °C		41 °F
10 °C		50 °F
15 °C		59 °F
20 °C		68 °F
25 °C		77 °F

pH v Nutrient Scale



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Work is well under way on the **twelfth edition** of the magazine. We will continue to showcase systems belonging to members of the online discussion forum, there will be information on vegetables and plants well suited to aquaponics systems, plus lots of useful hints and tips.

It's promising to be an exciting issue, packed full of information.

**Issue 12
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If you have any queries, please don't hesitate to contact us.

Backyard Aquaponics
PO Box 3350, Success.
Western Australia, 6964
+61 (08) 9414 9334
magazine@backyardaquaponics.com

